

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : Manoocher Birang, et al. Art Unit : Unknown
Serial No. : Unknown Examiner : Unknown
Filed : May 22, 2001
Title : METHOD OF FORMING A TRANSPARENT WINDOW IN A POLISHING
PAD

Commissioner for Patents
Washington, D.C. 20231

PRELIMINARY AMENDMENT

Prior to examination, please amend the application as follows:

In the specification:

Replace the paragraph beginning at page 1, line 6, with the following rewritten paragraph:

--This application is a continuation of pending U.S. Patent Application Serial No. 09/519,156, filed March 6, 2000, which is a continuation of U.S. Patent Application Serial No. 09/258,504, filed February 26, 1999, issued as U.S. Patent No. 6,045,439, which is a continuation of U.S. Patent Application Serial No. 08/689,930, filed August 16, 1996, issued as U.S. Patent No. 5,893,796, which is continuation-in-part of U.S. Patent Application Serial No. 08/605,769, filed February 22, 1996, issued as U.S. Patent No. 5,964,643, which is a continuation-in-part of U.S. Patent Application Serial No. 08/413,982, filed March 28, 1995, abandoned.--

Replace the paragraph beginning at page 13, line 15, with the following rewritten paragraphs:

-- Referring to FIGS. 3E and 3F, the polishing pad 18 may be assembled as follows. The two-level plug 600 is machined or molded from a solid piece of polyurethane. An aperture 612 is cut into a polishing pad 18. Alternately, the polishing pad 18 may be integrally molded with the aperture 612. The aperture 612 includes two sections. The first section of the aperture may

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be the hole 630 in covering layer 22 and the second section of the aperture may be the hole 632 in the backing layer 20. The aperture 612 matches the shape of two-level plug 600. The plug may be in the form of adjacent rectangular slabs having different cross-sectional areas. Specifically, the cross-sectional area of the lower plug portion 604 may be larger than the cross-sectional area of the upper plug portion 602. The upper plug portion 602 may have a length L_1 of about 2.0 inches and a height H_1 of about 0.5 inches. The lower plug portion 604 may have a length L_2 of about 2.2 inches and a height H_2 of about 0.7 inches. Thus, the lower plug portion 604 extends beyond the upper plug portion 602 to form a rim 616 having a width W_1 of about 0.1 inches. The plug may be oriented so that its longitudinal axis lies along a radius of the polishing pad.

Although FIGS. 3D-F show the upper plug portion 602 as having a smaller cross-sectional area than the lower plug portion 604, this is not necessary. Instead, the upper plug portion 602 may be larger than the lower plug portion 604. The upper plug portion 602 has a thickness T_1 equal to the thickness of covering layer 22, i.e., about fifty mils. Thus, the thickness T_1 is equal to the depth D_1 of the first section of the aperture. The lower plug portion 604 is thinner than the backing layer 20 by about ten mils. The lower plug portion 604 may have a thickness T_2 of about forty mils. Thus, the thickness T_2 is less than the depth D_2 of the second section of the aperture.--

In the claims:

Cancel claims 1-16.

Add claims 17-36.

17. A polishing pad for a chemical mechanical polishing apparatus, comprising:
an article having a polishing surface and a surface opposite the polishing surface,
a substantially transparent section formed in the polishing surface; and
an aperture formed in the surface opposite the polishing surface and aligned with the transparent section.

18. The polishing pad of claim 17, wherein the article includes a first layer with the polishing surface and a second layer adjacent to the first layer.

19. The polishing pad of claim 18, wherein the transparent section extends through the first layer.

20. The polishing pad of claim 18, wherein the aperture extends through the second layer.

21. The polishing pad of claim 17, wherein the transparent section and the aperture have substantially the same dimension.

22. The polishing pad of claim 17, wherein a top surface of the transparent section is substantially coplanar with the polishing surface.

23. A polishing pad for a chemical mechanical polishing apparatus, comprising:
a first layer having a polishing surface and a transparent section; and
a second layer adjacent to the first layer having an aperture substantially aligned with the transparent section.

24. The polishing pad of claim 23, wherein the first layer is formed of a polyurethane material.

25. The polishing pad of claim 25, wherein the transparent section is formed of a polyurethane material.

26. The polishing pad of claim 23, wherein the second layer is a backing layer.

27. A polishing pad for a chemical mechanical polishing apparatus, comprising:

an article having a polishing surface and a substantially transparent section, the transparent section having a first portion with a first dimension and a second portion with a second, different dimension.

28. The polishing pad of claim 27, wherein the article includes a first layer with the polishing surface and a second layer adjacent to the first layer.

29. The polishing pad of claim 28, wherein the transparent section extends through the first and second layers.

30. The polishing pad of claim 29, wherein the first section of the aperture extends through the first layer and the second section of the aperture extends through the second layer.

31. A chemical mechanical polishing apparatus, comprising:
a carrier head to hold a substrate;
a polishing pad having a polishing surface and a surface opposite the polishing surface, the polishing pad including a first layer having a polishing surface with a transparent section and a second layer adjacent to the first layer having an aperture substantially aligned with the transparent section; and
a motor to generate relative motion between the carrier head and the polishing pad.

32. The apparatus of claim 31, further comprising a platen to support the polishing pad.

33. The apparatus of claim 32, wherein the second layer abuts the platen.

34. The apparatus of claim 33, wherein a passage is formed in the platen, and the passage is substantially aligned with the aperture in the polishing pad.

35. The apparatus of claim 31, further comprising an optical monitoring system configured to direct a light beam through the aperture and the transparent section to impinge the substrate and measure reflections of the light beam from the substrate.

36. The apparatus of claim 31, wherein the transparent section and the aperture have substantially the same dimension.

REMARKS

Attached is a marked-up version of the changes being made by the current amendment.

Applicant asks that all claims be examined.

Please apply any other charges or credits to Deposit Account No. 06-1050.

Respectfully submitted,

Date: 5/22/01

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Version with markings to show changes made

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Although FIGS. 3D-F show the upper plug portion 602 as having a smaller cross-sectional area than the lower plug portion 604, this is not necessary. Instead, the upper plug portion 602 may be [smaller] larger than the lower plug portion 604. The upper plug portion 602 has a thickness T_1 equal to the thickness of covering layer 22, i.e., about fifty mils. Thus, the thickness T_1 is equal to the depth D_1 of the first section of the aperture. The lower plug portion 604 is thinner than the backing layer 20 by about ten mils. The lower plug portion 604 may have a thickness T_2 of about forty mils. Thus, the thickness T_2 is less than the depth D_2 of the second section of the aperture.--

In the claims:

Claims 1-16 have been cancelled.

Claims 17-36 have been added.

17. A polishing pad for a chemical mechanical polishing apparatus, comprising:
an article having a polishing surface and a surface opposite the polishing surface,
a substantially transparent section formed in the polishing surface; and
an aperture formed in the surface opposite the polishing surface and aligned with the transparent section.
18. The polishing pad of claim 17, wherein the article includes a first layer with the polishing surface and a second layer adjacent to the first layer.
19. The polishing pad of claim 18, wherein the transparent section extends through the first layer.
20. The polishing pad of claim 18, wherein the aperture extends through the second layer.
21. The polishing pad of claim 17, wherein the transparent section and the aperture have substantially the same dimension.

22. The polishing pad of claim 17, wherein a top surface of the transparent section is substantially coplanar with the polishing surface.

23. A polishing pad for a chemical mechanical polishing apparatus, comprising:
a first layer having a polishing surface and a transparent section; and
a second layer adjacent to the first layer having an aperture substantially aligned with the transparent section.

24. The polishing pad of claim 23, wherein the first layer is formed of a polyurethane material.

25. The polishing pad of claim 25, wherein the transparent section is formed of a polyurethane material.

26. The polishing pad of claim 23, wherein the second layer is a backing layer.

27. A polishing pad for a chemical mechanical polishing apparatus, comprising:
an article having a polishing surface and a substantially transparent section, the transparent section having a first portion with a first dimension and a second portion with a second, different dimension.

28. The polishing pad of claim 27, wherein the article includes a first layer with the polishing surface and a second layer adjacent to the first layer.

29. The polishing pad of claim 28, wherein the transparent section extends through the first and second layers.

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31. A chemical mechanical polishing apparatus, comprising:
a carrier head to hold a substrate;
a polishing pad having a polishing surface and a surface opposite the polishing surface, the polishing pad including a first layer having a polishing surface with a transparent section and a second layer adjacent to the first layer having an aperture substantially aligned with the transparent section; and
a motor to generate relative motion between the carrier head and the polishing pad.

32. The apparatus of claim 31, further comprising a platen to support the polishing pad.

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34. The apparatus of claim 33, wherein a passage is formed in the platen, and the passage is substantially aligned with the aperture in the polishing pad.

35. The apparatus of claim 31, further comprising an optical monitoring system configured to direct a light beam through the aperture and the transparent section to impinge the substrate and measure reflections of the light beam from the substrate.

36. The apparatus of claim 31, wherein the transparent section and the aperture have substantially the same dimension.